

EFFICACY AND SAFETY OF PYODINE-IODINE PLEURODESIS IN MALIGNANT PLEURAL EFFUSION

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ABSTRACT

Background: Malignant pleural effusion (MPE) is a common complication of advanced malignancies, leading to significant morbidity due to symptoms such as dyspnea and cough. Chemical pleurodesis is a widely used palliative procedure for managing recurrent MPE. Povidone-iodine, an easily available and cost-effective agent, has been suggested as an alternative sclerosing agent with promising results. **Objective:** To evaluate the efficacy and safety of povidone-iodine pleurodesis in patients with malignant pleural effusion. **Study Design:** Quasi-experimental design. **Setting:** Department of Pulmonology, Saidu Group of Teaching Hospital, Swat, Pakistan. **Duration of Study:** 02-December-2024 to 02-April-2025. **Methods:** 157 patients aged between 18 and 65 with confirmed MPE were enrolled. All patients underwent pleurodesis using 20 mL of 10% povidone-iodine mixed with 40 mL normal saline, administered via a 28-French chest tube placed in the sixth intercostal space. Efficacy was assessed by clinical symptom resolution (dyspnea and cough) and radiographic clearance of pleural effusion at six weeks post-procedure. Safety was evaluated by monitoring for adverse events, including fever ($\geq 38.0^{\circ}\text{C}$), nausea, and dizziness. Data were analyzed using SPSS version 24, with descriptive statistics reported. Associations were assessed with chi-square tests where appropriate (p -value < 0.05 considered significant). **Results:** The mean age of patients was 44.81 ± 13.37 years. The overall efficacy rate of pleurodesis was 86.6%. Fever occurred in 22.9% of patients, nausea in 17.8%, and dizziness in 9.6%. Safety was maintained in 84.1% of cases, indicating a favorable tolerance profile. **Conclusion:** Povidone-iodine pleurodesis demonstrated high efficacy and a favorable safety profile in managing malignant pleural effusions, offering an effective, affordable, and well-tolerated option for palliation with minimal complications.

Keywords: Malignant Pleural Effusion, Pyodine-Iodine, Pleurodesis, Efficacy, Safety, Palliative Care

INTRODUCTION

Malignant pleural effusion (MPE) is defined by the presence of malignant cells within the pleural fluid. The presence of MPE suggests systemic dissemination of cancer, meeting the criteria for M1a disease. Malignant cells obtained from pleural lavage in patients with inadequate concurrent PE have been recognized as a marker of micrometastatic disease, linking with an increased recurrence rate as well as diminished survival outcomes (1, 2). The tumor or hematogenous dissemination may have a direct impact on the parietal as well as visceral pleurae. In addition, propagation from visceral pleura could involve the parietal pleura; nevertheless, direct seeding of the parietal pleura has also been recorded (3, 4).

Lung, breast, and hematological malignancies symbolize the primary cancers linked to direct, contiguous, and hematogenous involvement of the pleura. Approximately 55% of those exhibiting pleural involvement will experience effusion (5). Wet pleural engagement is linked to a less favorable prognosis compared to dry pleural disease (6). Research indicates that exudative effusions occur in 77% of those with cancer. Eosinophilic pleural effusions, described as exudative pleural effusions with eosinophil levels exceeding 10%, have gradually risen in the past few years. This trend highlights the ongoing attempts to identify malignant eosinophilic PE as a separate clinical entity (7, 8).

Pleurodesis is a common procedure employed in treating MPE aimed at creating an adhesion between two layers of pleura to inhibit fluid accumulation in the pleural cavity. This is accomplished through the use of various sclerosing agents, which includes tetracycline, bleomycin, as well as povidone-iodine (9-11). The evaluation of the efficacy of particular sclerosing agents presents difficulties due to the limited populations of patients in reported trials, the use of different

success criteria, and the application of diverse pleurodesis techniques (2, 13). Povidone-iodine serves as a versatile as well as economical antiseptic agent, readily accessible in many different formulations including topical solutions, ointments, shampoos, as well as surgical scrubs (14). According to the study, the reported efficacy (82.2%) and safety (adverse effects like fever in 25%, nausea in 23.3%, and dizziness in 8.3%) of pyodine-iodine pleurodesis in malignant pleural effusion (15, 16).

Malignant pleural effusion is a common complication in advanced malignancies, often leading to significant symptoms and reduced quality of life, with current treatment options such as talc pleurodesis having varying degrees of success and safety profiles. Due to paucity of literature on this subject locally, the goal of this study is to determine the efficacy and safety of pyodine-iodine pleurodesis in malignant pleural effusion at our medical setup. The findings of this study will be helpful for our medical professionals in providing insights into the efficacy and safety of pyodine-iodine pleurodesis in controlling pleural effusions. This study will also be helpful in potentially offering a more effective and safer treatment modality for patients suffering from this debilitating condition.

METHODOLOGY

The study employed a quasi-experimental design conducted at the Department of Pulmonology, Saidu Group of Teaching Hospital, Swat from 02-December-2024 to 02-April-2025, after obtaining ethical clearance from the hospital. One hundred and fifty-seven patients were recruited using a non-probability consecutive sampling technique. The sample was calculated based on an assumed efficacy rate of 82.2% for pyodine-iodine pleurodesis (15), 95% confidence level and 6% absolute precision. Eligible participants included adults

aged 18-65 years who were diagnosed with malignant pleural effusion, while patients receiving corticosteroids or recent chemotherapy, those with abnormal thyroid or kidney function tests, and individuals with a cardiac disease history were excluded.

We secured informed consent from the patients. Demographic data were recorded. Medical histories regarding smoking status, diabetes and hypertension were also documented. The intervention involved inserting a 28-French chest tube through the sixth intercostal space in the mid-axillary line, under aseptic conditions. Following confirmation of complete lung expansion via chest radiography, a mixture of 20 mL of 10% povidone-iodine solution and 40 mL of normal saline was instilled through the tube over 30 minutes with subsequent clamping for four hours. Intravenous pethidine was administered as needed for pain management. The chest tube remained in place until drainage decreased below 100 mL/day, at which point it was removed.

Efficacy was assessed through resolution of dyspnea and cough symptoms along with radiographic confirmation of pleural effusion clearance at six-week follow-up. Safety parameters included monitoring for fever (oral temperature $\geq 38.0^{\circ}\text{C}$) nausea and dizziness. All procedures were supervised by a consultant pulmonologist with minimum five years post-fellowship experience.

SPSS 26 was utilized for analysis. Variables like age and BMI were calculated by Mean \pm SD, categorical variables were presented as frequencies and percentages, and potential effect modifiers, including demographic and clinical characteristics, were analyzed through a post-stratification chi-square test at the 5% significance level.

RESULTS

Mean age of the patients in our study was 44.81 ± 13.37 years. Their average BMI was 25.66 ± 1.96 kg/m². Gender distribution revealed a slight male predominance with 84 (53.5%) males and 73 (46.5%) females. Medical history highlighted that 48 (30.6%) participants had diabetes and 51 (32.5%) had hypertension. 29 (18.5%) individuals reported smoking while the majority 128 (81.5%) were non-smokers (Table 1). Regarding the safety profile, adverse effects were observed in some patients. Fever was reported by 36 (22.9%), while nausea was

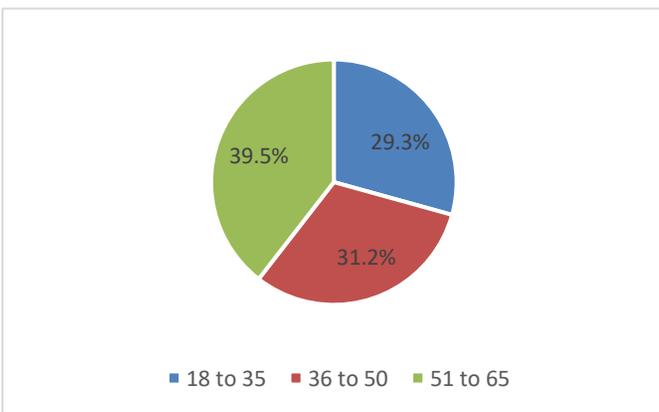


Figure 1: Age distribution

Table 4: Stratification of efficacy with various parameters

Various parameters	Efficacy				P value	
	Yes		No			
	N	%	N	%		
Age distribution (Years)	18 to 35	41	30.1%	5	23.8%	P > 0.05
	36 to 50	45	33.1%	4	19.0%	
	51 to 65	50	36.8%	12	57.1%	
BMI (Kg/m2)	18 to 24.9	60	44.1%	10	47.6%	P > 0.05
	> 24.9	76	55.9%	11	52.4%	
Gender	Male	75	55.1%	9	42.9%	P > 0.05

reported by 28 (17.8%), and dizziness by 15 (9.6%). The majority did not experience these symptoms with 121 (77.1%) reporting no fever 129 (82.2%) no nausea and 142 (90.4%) no dizziness (Table 2). The efficacy of pyodine-iodine pleurodesis was 136 (86.6%), while 21 (13.4%) did not achieve the desired outcome. Safety was maintained in 132 (84.1%) cases (Table 3). Stratification of efficacy and safety with various parameters can be seen in Tables 4 and 5.

Table 1: Demographic characteristics of patients

Demographic characteristics	Frequency	%	
Gender	Male	84	53.5%
	Female	73	46.5%
Socioeconomic status	Poor (< 50K Rs/Month)	39	24.8%
	Middle class (50K to 100K Rs/Month)	90	57.3%
	Rich (> 100K Rs/Month)	28	17.8%
Education status	Educated	61	38.9%
	Un-educated	96	61.1%
Residence area	Rural	68	43.3%
	Urban	89	56.7%
Occupation status	Employed	71	45.2%
	Unemployed	86	54.8%
Diabetes	Yes	48	30.6%
	No	109	69.4%
Hypertension	Yes	51	32.5%
	No	106	67.5%
Smoking	Yes	29	18.5%
	No	128	81.5%
Age distribution (Years)	18 to 35	46	29.3%
	36 to 50	49	31.2%
	51 to 65	62	39.5%

Table 2: Safety profile

Safety profile	Frequency	Percentage	
Fever	Yes	36	22.9%
	No	121	77.1%
Nausea	Yes	28	17.8%
	No	129	82.2%
Dizziness	Yes	15	9.6%
	No	142	90.4%

Table 3: Efficacy and safety of pyodine-iodine pleurodesis

Efficacy and safety	Frequency	Percentage	
Efficacy	Yes	136	86.6%
	No	21	13.4%
Safety	Yes	132	84.1%
	No	25	15.9%

Socioeconomic status	Female	61	44.9%	12	57.1%	P > 0.05
	Poor (< 50K Rs/Month)	33	24.3%	6	28.6%	
	Middle class (50K to 100K Rs/Month)	79	58.1%	11	52.4%	
	Rich (> 100K Rs/Month)	24	17.6%	4	19.0%	
Education status	Educated	54	39.7%	7	33.3%	P > 0.05
	Un-educated	82	60.3%	14	66.7%	
Residence area	Rural	62	45.6%	6	28.6%	P > 0.05
	Urban	74	54.4%	15	71.4%	
Occupation status	Employed	58	42.6%	13	61.9%	P > 0.05
	Unemployed	78	57.4%	8	38.1%	
Diabetes	Yes	40	29.4%	8	38.1%	P > 0.05
	No	96	70.6%	13	61.9%	
Hypertension	Yes	45	33.1%	6	28.6%	P > 0.05
	No	91	66.9%	15	71.4%	
Smoking	Yes	27	19.9%	2	9.5%	P > 0.05
	No	109	80.1%	19	90.5%	

Table 5: Stratification of safety with various parameters

Various parameters		Safety				P value
		Yes		No		
		N	%	N	%	
Age distribution (Years)	18 to 35	38	28.8%	8	32.0%	P > 0.05
	36 to 50	43	32.6%	6	24.0%	
	51 to 65	51	38.6%	11	44.0%	
BMI (Kg/m2)	18 to 24.9	60	45.5%	10	40.0%	P > 0.05
	> 24.9	72	54.5%	15	60.0%	
Gender	Male	68	51.5%	16	64.0%	P > 0.05
	Female	64	48.5%	9	36.0%	
Socioeconomic status	Poor (< 50K Rs/Month)	33	25.0%	6	24.0%	P > 0.05
	Middle class (50K to 100K Rs/Month)	77	58.3%	13	52.0%	
	Rich (> 100K Rs/Month)	22	16.7%	6	24.0%	
Education status	Educated	50	37.9%	11	44.0%	P > 0.05
	Un-educated	82	62.1%	14	56.0%	
Residence area	Rural	59	44.7%	9	36.0%	P > 0.05
	Urban	73	55.3%	16	64.0%	
Occupation status	Employed	58	43.9%	13	52.0%	P > 0.05
	Unemployed	74	56.1%	12	48.0%	
Diabetes	Yes	39	29.5%	9	36.0%	P > 0.05
	No	93	70.5%	16	64.0%	
Hypertension	Yes	44	33.3%	7	28.0%	P > 0.05
	No	88	66.7%	18	72.0%	
Smoking	Yes	25	18.9%	4	16.0%	P > 0.05
	No	107	81.1%	21	84.0%	

DISCUSSION

A comparative analysis of the results with similar variables from the other studies revealed consistent patterns and nuanced differences offering critical insights into the clinical utility of this intervention.

Our study involved 157 participants with mean age 44.81 ± 13.37 years, contrasting with older cohorts reported in other studies. For instance, Godazandeh et al documented a mean age of 64.7 ± 8.4 years, while Kahrom et al (2017) reported a mean age of 62.1 ± 11.4 years (14,15). This discrepancy may reflect regional disparities in cancer epidemiology or differences in healthcare access as younger populations in certain regions might present earlier with advanced malignancies, although we observed that majority of our patients were in the age group of 51 to 65 years.

Gender distribution in the current study showed a slight male predominance (53.5%), diverging from Godazandeh et al., where females were 58.3%. This is likely due to the higher prevalence of

breast cancer in their cohort (14). These demographic variations underscore the importance of contextual factors in interpreting study outcomes. Primary malignancies associated with MPE are lung, breast, and ovarian. Godazandeh et al reported 52.7% patients in their cohort having lung cancer while 22.2% had breast cancer.¹⁴ Kahrom et al observed a higher incidence of lung cancer, which was followed by lymphoma, highlighting geographic or diagnostic differences in cancer patterns (15). Sobhy et al showed that majority of their patients had breast cancer (16). Neto et al reported a higher frequency of breast cancer in their study as their cohort primarily consisted of female patients (17). The malignancies are associated with advance form of MPE. However, we did not analyze the clinical profile of MPE in these patients; future studies should focus on the profile of MPE.

The safety rate in our study was 84.1%. The safety profile of povidone-iodine pleurodesis in our study demonstrated adverse effects such as fever which was present in 22.9% patients, nausea 17.8% and dizziness 9.6%. These findings are comparable to those of

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Sobhy et al, as they reported that 25% of patients in their study had fever, around 23% had nausea, and 8.3% had dizziness (16). Neto et al's study revealed that the side effects of povidine-iodine was mild thoracic pain which was observed in 16.4% of cases and pleural empyema in 1.6% (17). Kahrom et al observed post-pleurodesis pain in 26.9% of patients (15).

Efficacy in our study was 86.6% and a partial response of 13.4% yielding an overall success rate of 84.1%. These results align with Godazandeh et al, who reported 72.2% complete response and 91.6% efficacy in terms of overall success (14). Kahrom et al reported efficacy 82.2%. (15) and Neto et al achieved a 98.4% success rate (17). Given these findings, povidone-iodine pleurodesis demonstrates consistent efficacy and safety across diverse populations. Its cost-effectiveness and accessibility make it particularly valuable in resource-limited settings.

CONCLUSION

In conclusion, povidone-iodine pleurodesis exhibited high efficacy and a favorable safety profile for managing malignant pleural effusions with fewer complications. Its cost-effectiveness and accessibility make it a practical alternative in resource-limited settings.

DECLARATIONS

Data Availability Statement

All data generated or analysed during the study are included in the manuscript.

Ethics approval and consent to participate

Approved by the department Concerned. (144-ERB/024)

Consent for publication

Approved

Funding

Not applicable

CONFLICT OF INTEREST

The authors declared an absence of conflict of interest.

AUTHOR CONTRIBUTION

FARMAN KHAN (PGR)

Conception of Study, Data Collection, Development of Research, Study Design, manuscript Review, Manuscript Drafting, and final approval of manuscript.

AKHTAR ALI KHAN (ASSISTANT PROFESSOR)

Methodology Design, Critical input, and final approval of manuscript.

INAM ULLAH (PGR)

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Review of Literature.

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